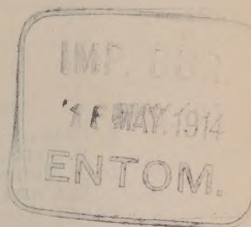


THE NORTH CAROLINA  
COLLEGE OF AGRICULTURE AND MECHANIC ARTS  
AGRICULTURAL EXPERIMENT STATION

W. A. WITHERS, A.M., ACTING DIRECTOR.



# Rational Stock Feeding

INCLUDING

- I. Definitions of Terms, and Composition and Digestibility of Foods
- II. Feeding Standard
- III. How Stock Rations can be Calculated

F. E. EMERY AND J. M. JOHNSON



RALEIGH, N. C.

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# NORTH CAROLINA COLLEGE OF AGRICULTURE AND MECHANIC ARTS

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# RATIONAL STOCK-FEEDING.

INCLUDING

- I. DEFINITIONS OF TERMS, AND COMPOSITION AND DIGESTIBILITY OF FOODS.
- II. FEEDING STANDARDS.
- III. HOW STOCK RATIONS CAN BE CALCULATED.

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BY F. E. EMERY, M. S., AGRICULTURIST. J. M. JOHNSON, M. S., ASS'T IN AGRICULTURE.

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## I. DEFINITIONS OF TERMS, AND COMPOSITION AND DIGESTIBILITY OF FOODS.

The value of food materials depend largely upon their composition and digestibility. The former is ascertained by chemical analysis; the latter by actual trials with animals.

### COMPOSITION OF FEEDING-STUFFS. NUTRIENTS.

By chemical analysis, foods are separated into six classes of substances, viz.:

1. *Water*, which is present in all feeding-stuffs. It composes about 80 per cent. of green and succulent fodders, about 90 per cent. of root crops, 75 per cent. of silage, and 10 to 15 per cent. of hays and grains. In these it is present as mechanically adhering or hygroscopic moisture. It is a necessary constituent of the animal body, of which it makes up 40 to 65 per cent. Water is determined by heating the substance for several hours at the temperature of boiling water, at which temperature it passes off as steam.

2. *Ash* is the inorganic, or mineral matter of plants, and is the residue left after burning till all volatile material is driven off. It is composed mainly of soda, potash, lime, and magnesia, in the form of phosphates, sulphates, chlorides, and carbonates. Ash furnishes the materials for the bony structure of animals, and enters to a much less extent into the tissues and organs.

3. *Fats (ether extract)* represents whatever is dissolved from foods by dry ether. It is composed mainly of fats and oils, but contains, in addition, quantities of gums, wax and coloring matter, depending upon the substances extracted.

4. *Protein*, the term as used in connection with fodder analyses, includes *Albuminoids* and *Amides*, the albuminoids being the more

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NOTE.—This bulletin is a revision of No. 106. with many additions to the tables which increases the usefulness of the work to the practical feeder.

valuable, and, at the same time, composing by far the larger portion of the protein compounds. They are the nitrogenous compounds of plants and animals, and are determined by estimating the nitrogen in them, which element composes about 16 per cent. of the weight of protein substances. None of the other classes of substances contain nitrogen. They are represented in the animal body by ligaments, lean meat, muscles, tendons and tissues. *Amides* are unorganized protein, or protein in a transitory stage, and are very abundant in pasture grass and young growing plants, but change largely into organized protein as the plant reaches maturity. Amides are considered of much less nutritive value than albuminoids, and act as protectors or conservers of the latter.

5. *Crude fiber, or cellulose*, is the cell wall and structure material of plants, and is usually the most indigestible portion of them, but when digested is considered of equal value to starch and sugar. The lint of cotton is almost pure cellulose. Its composition is similar to that of starch. It is determined by boiling the food-stuff with weak acid and alkali, thus dissolving all other constituents. *Crude fiber and nitrogen-free extract* taken together are known as *carbohydrates*.

6. *Nitrogen-free extract* is the term applied to those non-nitrogenous constituents of foods which are represented in the main by sugars, starch, dextrin, and gums. They all contain carbon, hydrogen, and oxygen, but no nitrogen, as does protein. Nitrogen-free extract is estimated by difference, it being equal to the difference between the sum of the above five constituents, water, ash, protein, fats, and crude fiber, and 100. It is, perhaps, the most inaccurate of all the determinations in a food analysis, inasmuch as all the errors and differences in the other determinations fall upon it. It seems very desirable that some of the constituents, at least, of the nitrogen-free extract should be determined directly. This is already being done to a limited extent. Some preliminary work has been done in this laboratory in that line, and the study will be carried on.

*Dry matter and organic matter.* Neither of these terms represent a single class of constituents, or nutrients. Dry matter is what is left of a plant, or food stuff, after the water is driven off or subtracted, and organic matter is dry matter minus the ash, for example: If the original food-stuff as fed is represented as 100 per cent., and it contains 10 per cent. of water and 5 per cent. of ash, then dry matter is equal to 100 per cent., less ten per cent. water, or 90 per cent., and organic matter is 90 per cent. dry matter less 5 per cent. ash, or 85 per cent.

To enable those not familiar with the subject to gain a clear idea of the parts of food-stuffs, and the terms representing them as used in fodder analyses, the following statement is presented:

Food-stuff.	{ Water.	{ Ash.	{ Protein.
	{ Dry matter.	{ Organic matter.	{ Fats.
			{ Carbohydrates.
			{ Nitrog'n-free ex't.
			{ Crude fiber.

*Nutrients.* Protein, fats, carbohydrates, nitrogen-free extract and crude fiber and mineral matter are called nutrients, because of their functions in animal nutrition. Nitrogen-free extract and crude fiber are included together under the one name of carbohydrates, because they are all compounds of carbon, hydrogen and oxygen, and the digestible portion of each is considered of equal value and perform the same offices in animal nutrition. Familiar examples of the four classes of nutrients are presented below. Water is omitted because it is the same, whether taken in food or drink, and we do not feed a fodder for the sake of the water it contains:

Protein.	{ Albumen (white of egg), washed lean meat, casein, or curd of milk, gluten of flour, fibrin of blood, gelatin, glue, etc.
Fats.	{ Cotton-seed oil, linseed oil, olive oil, corn oil, wheat oil, oat oil; the fat of milk (butter), the fat of meat (hog lard), mutton (mutton suet), beef (tallow), fish oil, etc.
Carbohydrates.	{ Sugars (cane sugar, milk sugar, and glucose), starch, dextrin, gums, woody fiber, etc.
Mineral matter.	{ Sodium chloride (common salt), phosphates of lime and soda, etc.

#### FUNCTIONS OF NUTRIENTS.

Having defined the classes of nutrients as they occur in foods, it is of interest now to state the offices performed by them in animal nutrition.

*Water* is not a nutrient in the sense in which the term is here used, though the animal body can not be supported without it.

*The ash, or mineral matter* furnishes the material for the bony structure of the body, and, to a far less extent, of the soft tissues. Most of our foods and rations contain an abundant supply of the mineral element, so little or no notice need be taken of them in feeding.

*Protein* differs from all the other nutrients, in containing the element nitrogen, and is the producer of flesh, ligaments, muscles, tendons, sinews, hair, hide, and all portions of the animal machine which has strength, except the bones. The protein bodies are of the utmost importance in the animal structure. They compose the larger part of the animal machinery, and are the exclusive source of its repair as occasioned by the continuous wear and tear of the system, due to the internal and external movements of the body; they are the basis of blood, and the source of casein in milk; and in the absence of sufficient quantities of fats and carbohydrates in the food for the production of heat and energy, they are transformed into fats, and perform the office of fats in nutrition. This latter transformation may also result from an excess of protein. The heat-producing power of protein is but little different from that of

carbohydrates; the amount of fat it produces is probably much less, while as a heat-producer, fat is worth about 2.25 times as much as protein. These facts, combined with the high cost of protein in foods, renders it usually uneconomical to feed protein for the production of fat to be either stored in the body as such, or to be used as fuel, since the fats and carbohydrates perform these offices, and cost much less. It is to be remembered that the protein bodies are the "flesh formers," and though they can perform the offices of fats and carbohydrates in nutrition, fats and carbohydrates can not take the place of protein.

*Fats and carbohydrates* perform the same offices in the body—those of the production of heat to keep the body warm, and the force by which the animal mechanism is run. They are the "heat and force producers," and are consumed in the body as fuel, giving out heat, muscular, and intellectual energy. For the production of heat and energy one pound of fat is worth about 2.25 times as much as a pound of carbohydrates. Fats give out about 2.25 times the heat that carbohydrates do. Besides serving as heat and force producers, carbohydrates are converted in the animal body into fats, and, together with the fats of the food, are stored as such in fatty tissue. The value of carbohydrates for the production of fats is supposed to be in about the same proportion as the heat-producing powers of carbohydrates to fats.

Carbohydrates are not found in the animal body as such, but are converted into fats. There are, therefore, only four classes of substances composing the animal body, viz: water, ash, fats, and protein.

The main and distinctive offices of the nutrients of foods are: Ash, or mineral constituents, these are bone-producers; the protein bodies are the flesh-formers; and fats and carbohydrates are the heat and force producers. The nutrients already located in the animal body perform the same offices as the corresponding ones of foods. In case of a deficiency of nutrients in foods given, the fats, or protein and fats, are drawn upon to assist in running the animal machine. Carbohydrates and fats, in being consumed, prevent the consumption of protein, but so soon as they become insufficient to supply the necessary heat and force for the body, protein substances, in the form of lean meat, muscle, etc., are drawn upon. A sufficient supply of carbohydrates and fats is, therefore, necessary to the protection of the animal frame-work. The following is a statement of the

#### FUNCTIONS OF FOOD IN THE ANIMAL BODY.

*Food nourishes and supports the body.*

By supplying—

1. The materials of which it is made.
2. The materials to repair its waste and wear.

By producing—

3. Heat to keep it warm.
4. Force and energy for muscular and other work.

*These offices are performed by the nutrients:*

Protein -----	{	Which is the basis of blood, lean meat, tendons, ligaments, sinews, hair, skin, etc.— Is converted into fats. Is used as fuel for heat and force.
Fats -----	{	Are used as fuel for heat and force. Are stored in the fatty tissue of the body.
Carbohydrates (Nitrogen-free extract and crude fiber)	{	Are converted into fats and stored in the body, or Are used as fuel for heat and force.
Mineral matter	{	Forms bone and a very small part of muscular and fatty tissues.

### THE DIGESTIBILITY OF FEEDING-STUFFS.

As was stated in the beginning, the value of feeding-stuffs depends upon their composition and digestibility. The element of composition has been discussed; next will be considered the digestibility.

All the food eaten by an animal is not digested and used in nutrition, but only that portion which is dissolved by the alimentary agents and taken into the circulation of the system, the portion which is assimilated. The residue, or undigested portion, forms the solid excrement of the animal.

The digestibility of a considerable number of American cattle foods have already been determined. This is done by feeding a uniform and weighed quantity of food of known composition for sufficient length of time to eliminate all residues of previously fed fodders, then collecting the dung for a number of days, usually five or six, weigh and analyze. The dung contains the undigested food residue, and the difference between this and the total food consumed gives the portion digested. Thus, two foods having the same composition, their values would be determined by the amounts of nutrients digested from each.

### AVERAGE COMPOSITION AND DIGESTIBLE NUTRIENTS IN FEEDING-STUFFS.

In Table V is presented the composition, most of them averages, of quite a number of analyses, of American feeding-stuffs of most interest in North Carolina. The composition, especially of coarse fodders, is affected by so many conditions, as soil, climate, season, cultivation, harvesting, handling, stage of maturity, etc., that the greater the number of good analyses entering into an average the nearer may the average be expected to represent the general composition.\*

The analyses of the feeding-stuffs shown in the table represent their composition as they are usually fed to animals. In addition

to the chemical composition of the foods obtained by analysis, is presented, also, the percentages of digestible nutrients in each, calculated from the percentage composition of the foods in the table by multiplying by the *coefficients of digestibility* of each food and nutrient contained in Table IV, which follows.

#### COEFFICIENTS OF DIGESTIBILITY.

The proportions of the different nutrients digested are obtained by dividing the total amount of each nutrient consumed by the amount digested. In Table IV are brought together the coefficients of digestibility of all the fodders, the compositions of which are presented in Table V. These are mainly the results of American experiments.

#### AMOUNT OF DIGESTIBLE MATTER IN FEEDING STUFFS.

In Table V is given the average composition of foods, and in Table IV their digestibility. By combining the data of these two tables the per cents. of digestible matter of the same foods, also shown in Table V, are obtained in the following way:

	Cowpea-vine hay contains per cent., or pounds in 100 of (see Table V).		Coefficients of digestibility of cowpea vine hay (see Table IV).		Per cent., or lbs of digestible matter in 100 of cowpea-vine. hay.
Dry matter .....	88.10	×	59.2	=	52.15
Protein .....	14.43	×	64.5	=	9.31
Fats .....	2.49	×	50.0	=	1.24
Nitrogen-free extract	41.22	×	70.7	=	29.14
Crude fiber .....	21.54	×	42.9	=	9.24
Ash .....	8.42	×	45.1	=	3.79

They may be regarded as representing, as well as per cent., the number of pounds of digestible nutrients in 100 pounds of the various foods in the condition in which they are fed, and are the amounts of these foods used by animals in the support of their bodies.

From this table of percentage of digestible matter in foods, it is easy to ascertain the amounts of digestible nutrients eaten per day by the animals we may be feeding. We only need to multiply the number of pounds of the food or foods eaten by the per cent. of digestible nutrients in them. Say a cow is eating 20 pounds cowpea-vine hay per day, then the amounts of digestible nutrients consumed are found as follows:

	Per cent. of diges- tible matter in cowpea vine hay.		No. lbs hay eaten.		Lbs of diges- tible mat- ter eaten.
Dry matter .....	52.15	×	20	=	10.43
Protein .....	9.31	×	20	=	1.86
Fats .....	1.24	×	20	=	.25
Nitrogen free extract	29.14	×	20	=	5.82
Crude fiber .....	9.24	×	20	=	1.85
Ash .....	3.79	×	20	=	.76

The amount of digestible matter eaten by any animal may be obtained in a similar way. Where two foods are fed in a ration each will have to be operated upon separately, and their sums taken for the total digestible nutrients consumed.

To save the feeder the time and trouble of making these calculations, the amounts of digestible dry matter and nutrients in 1, 2, 3, 4, 5, 10, and 2,000 pounds of the coarse fodders, grains, seeds, and by-products, whose composition and digestibility are presented in Tables V and IV, have been carefully calculated, and are given in Table III. The nitrogen-free extract and crude fiber have been combined in this table under the one name of carbohydrates, because the digestible portion of each is considered of equal value, and they perform the same offices in animal nutrition. The ash is also omitted, for the reason given in the first part of this bulletin. This table must not be supposed to give the absolute amounts of digestible nutrients contained in all the qualities of these various foods, for no two of the same kind are likely to have exactly the same composition, and may differ very widely, nor are any two animals, even of the same kind, likely to possess the same digestive capacity and power of assimilating foods. Even with these unavoidable defects the knowledge thus ascertained can be put to practical use, and, in connection with the Feeding Standards, soon to be described, stock can be fed far more intelligently, safely, and economically.

The digestible nutrients have been calculated for the most convenient numbers only, but by combining these and adding the corresponding nutrients, the amounts of digestible nutrients can be easily obtained for any quantity of food that is likely to be fed under ordinary circumstances. Thus, suppose we desire to know the pounds of nutrients in 15 pounds of any of the foods, we have merely to add the nutrients corresponding to the 10 and 5 pound weights; for 19 add those for 10, 5, and 4, and so on for any number up to 20, which may be obtained by moving the decimal point two places to the left in the line for 2,000 pounds. For numbers larger than 20, multiples may be used, as for 40 take four times the nutrients for 10.

The nutrients in 2,000 pounds of each of the foods were inserted in this table to enable comparison of the digestible nutrients in one ton of the different foods. The chief value of Table III will be found in the compounding of rations, and it will receive further consideration under that head.

## II. FEEDING STANDARDS.

The composition and digestibility of feeding stuffs have been considered, and in the following tables the amounts of digestible nutrients in different quantities of foods will be presented. The next question asked by the interested feeder is, how much and in what proportion should the digestible nutrients be fed to different animals

for different purposes? This is a very difficult question to answer with accuracy. The results of a great many years patient investigation on this subject in Germany have found expression in the German Feeding Standards. In these it has been attempted to give the needs of various animals, both as to amount of food and amount and proportion of digestible nutrients. The standards compiled by Wolff (Tables I and II) on this subject have been widely published and used in this country, and have, especially of late years, been the subject of discussion and criticism. We have no feeding standards of our own in America, and while the German ones no doubt need to be modified and changed to suit our climate, foods and animals, yet the principle and example are good, and can serve as guides till we have accumulated sufficient data to formulate ones better suited to our particular needs.

It is to be remembered that the feeding standards presented do not represent invariable scientific facts, but are the average results of a great many carefully conducted experiments; then, too, the compositions and coefficients of digestibility of the feeding-stuffs are the averages of analyses and digestion experiments. These facts borne in mind, the feeder will not expect certain definite results from them.

Another observation of interest in connection with feeding standards, is the greater proportion of protein to carbohydrates and fats in the rations for young and growing animals, than in those for grown, fattening, and working ones. This is precisely as would be expected, since the bodily frame work of the young animal is being built up at this stage of growth, and hence requires a larger proportion of protein, or flesh formers.

#### NUTRITIVE RATIO.

"Total organic matter" in the above table represents the water-free food, minus the ash; the "total nutritive substance" is the sum of digestible protein, carbohydrates, and fats; and the "nutritive ratio" is the ratio of the digestible protein to the sum of the digestible carbohydrates and fats, the fats being previously multiplied by 2.5.\*

It will be seen from Table I that the standards are for animals of 1,000 pounds live weight. The standards are to be increased or diminished in proportion as the weight of the animal is greater or less than 1,000. In Table II, they have been thus culculated to correspond with the weights of some animals weighing less than 1,000 pounds.

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\* Experimenters and feeders now generally use factors varying from 2.2 to 2.27 for bringing fats to the same nutritive basis as carbohydrates, and we agree with them that these factors are more nearly correct than 2.5; but we adhere to the latter in order that our ratios may be comparable with those in the German standard.

TABLE I. FEEDING STANDARDS.—ACCORDING TO WOLFF.

*Per day and per 1,000 lbs. live weight.*

	Total organic substance.*	NUTRITIVE (DIGESTIBLE) SUBSTANCES.			Total nutritive substance.**	Nutritive ratio.
		Protein.	Carbohydrates.†	Fats.		
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
1. Oxen at rest in stall .....	17.5	0.7	8.0	0.15	8.85	1: 12.0
2. Wool sheep, coarser breeds .....	20.0	1.2	10.3	0.20	11.70	1: 9.0
Wool sheep, finer breeds .....	22.5	1.5	11.4	0.25	13.15	1: 8.0
3. Oxen moderately worked .....	24.0	1.6	11.3	0.30	13.20	1: 7.5
Oxen heavily worked .....	26.0	2.4	13.2	0.50	16.10	1: 6.0
4. Horses lightly worked .....	20.0	1.5	9.5	0.40	11.40	1: 7.0
Horses moderately worked .....	22.5	1.8	11.2	0.60	13.6	1: 7.0
Horses heavily worked .....	25.5	2.8	13.4	0.80	16.2	1: 6.0
5. Milk cows .....	24.0	2.5	12.5	0.40	15.40	1: 5.4
6. Fattening oxen, 1st period .....	27.0	2.5	15.0	0.50	18.00	1: 6.5
Fattening oxen, 2d period .....	26.0	3.0	14.8	0.70	18.50	1: 5.5
Fattening oxen, 3d period .....	25.0	2.7	14.8	0.60	18.10	1: 6.0
7. Fattening sheep, 1st period .....	26.0	3.0	15.2	0.50	18.70	1: 5.5
Fattening sheep, 2d period .....	25.0	3.5	14.4	0.60	18.50	1: 4.5
8. Fattening swine, 1st period .....	36.0	5.0	27.5		32.50	1: 5.5
Fattening swine, 2d period .....	31.0	4.0	24.0		28.00	1: 6.0
Fattening swine, 3d period .....	23.5	2.7	17.5		20.20	1: 6.5
9. Growing cattle:						
<i>Av. live weight</i>						
<i>Age. Mos. per head.</i>						
2—3      150 lbs.....	22.0	4.0	13.8	2.0	19.8	1: 4.7
3—6      300 lbs.....	23.4	3.2	13.5	1.0	17.7	1: 5.0
6—12     500 lbs.....	24.0	2.5	13.5	0.6	16.6	1: 6.0
12—18    700 lbs.....	24.0	2.0	13.0	0.4	15.4	1: 7.0
18—24    850 lbs.....	24.0	1.6	12.0	0.3	13.9	1: 8.0
10. Growing sheep:						
5—6      56 lbs.....	28.0	3.2	15.6	0.8	19.6	1: 5.5
6—8      67 lbs.....	25.0	2.7	13.3	0.6	16.6	1: 5.5
8—11     75 lbs.....	23.0	2.1	11.4	0.5	14.0	1: 6.0
11—15    82 lbs.....	22.5	1.7	10.9	0.4	13.0	1: 7.0
15—20    85 lbs.....	22.0	1.4	10.4	0.3	12.1	1: 8.0
11. Growing fat pigs:						
2—3      50 lbs.....	42.0	7.5	30.0		37.5	1: 4.0
3—5      100 lbs.....	34.0	5.0	25.0		30.0	1: 5.0
5—6      125 lbs.....	31.5	4.3	23.7		28.0	1: 5.5
6—8      170 lbs.....	27.0	3.4	20.4		23.8	1: 6.0
8—12     250 lbs.....	21.0	2.5	16.2		18.7	1: 6.5

NOTE.—The feeding periods mentioned in the above table have reference to the divisions of the whole time an animal is fed, and their respective lengths will depend on how long the animal is to be fed, its condition at beginning, and the judgment of the feeder.

\*Represents the water free food (or dry matter), less the ash.

†Nitrogen-free extract and crude fiber are taken together to form carbohydrates.

\*\*Sum of the three preceding columns.

TABLE II. FEEDING STANDARDS.

*Per day and per head.*

			Total organic substance.	NUTRITIVE (DIGESTI- BLE) SUBSTANCES.			Total nutritive substance.	Nutritive ratio.
				Protein.	Carbohy- dratee.	Fats.		
Growing cattle :	<i>Av. live weight</i>		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
<i>Age. Mos.</i>	<i>per head.</i>							
2—3	150 lbs.....	3.3	0.6	2.1	0.30	3.00	1:4.7	
3—6	300 lbs.....	7.0	1.0	4.1	0.30	5.40	1:5.0	
6—12	500 lbs.....	12.0	1.3	6.8	0.30	8.40	1:6.0	
12—18	700 lbs.....	16.8	1.4	9.1	0.28	10.78	1:7.0	
18—24	850 lbs.....	20.4	1.4	10.3	0.26	11.96	1:8.0	
Growing sheep :								
5—6	56 lbs.....	1.6	0.18	0.87	0.045	1.095	1:5.5	
6—8	67 lbs.....	1.7	0.17	0.85	0.040	1.060	1:5.5	
8—11	75 lbs.....	1.7	0.16	0.85	0.037	1.047	1:6.0	
11—15	82 lbs.....	1.8	0.14	0.89	0.032	1.062	1:7.0	
15—20	85 lbs.....	1.9	0.12	0.88	0.025	1.026	1:8.0	
Growing fat swine :								
2—3	50 lbs.....	2.1	0.38	1.50		1.88	1:4.0	
3—5	100 lbs.....	3.4	0.50	2.50		3.00	1:5.0	
5—6	125 lbs.....	3.9	0.54	2.96		3.50	1:5.5	
6—8	170 lbs.....	4.6	0.58	3.47		4.05	1:6.0	
8—12	250 lbs.....	5.2	0.62	4.05		4.67	1:6.5	

NOTE.—The German pound equals 1.1 pounds avoirdupois. The above figures should therefore be increased correspondingly to represent American pounds, but in practice this is probably not necessary, since these weights represent only the approximate needs of the animals.

### III. HOW STOCK RATIONS CAN BE CALCULATED.

A ration is the amount of food eaten by an animal per day. Table III contains data in a most available and handy form for compounding rations to correspond with the German standards just given, or with any other formula which may have proven valuable in the experience of the individual feeder, or for estimating the amounts of digestible nutrients the farm animals may now be consuming.

An example or two will make sufficiently clear the calculation and compounding of rations, so that the feeder, by applying results in Table I to whatever foods he may have, can make up rations to correspond with whatever formula he may wish. Suppose we want to compound a ration for a 1,000 pound milch cow, and have corn silage, cowpea-vine hay, corn meal, and cotton-seed meal from which to make it up. By reference to Table III, we find the following amounts of nutrients corresponding to the weights of food taken.

FOODS TAKEN.	Weight. Lbs.	DIGESTIBLE.		
		Protein. Lbs.	Carbo- hydrates. Lbs.	Fats. Lbs.
Corn silage .....	30	.216	3.984	.120
Cowpea-vine hay .....	12	1.117	4.605	.148
Corn meal .....	5	.266	2.958	.180
Total .....	47	1.599	11.547	.448

Using the amounts of corn silage, cowpea-vine hay, and corn meal for making the ration, it falls only slightly below the standard in amounts of carbohydrates and fats, but is notably deficient in protein, so we need to add to it a small quantity of some food rich in protein. Cotton-seed meal is a common food with us, and a good one for this purpose. We will then add to the ration as above,  $2\frac{1}{2}$  pounds of cotton-seed meal:

FOODS TAKEN.	Weight. Lbs.	DIGESTIBLE.		
		Protein. Lbs.	Carbo- hydrates. Lbs.	Fats. Lbs.
Ration as above .....	47	1.599	11.547	.448
Cotton-seed meal .....	$2\frac{1}{2}$	.840	.575	.240
Total .....	$49\frac{1}{2}$	2.439	12.122	.688
Standard for 1,000-pound cow		2.50	12.50	.40

Nutritive ratio of above ration. 1 to 5.67, obtained thus: (fats .688  $\times$  2.5) + carbohydrates, (12.122) = 13.842.  $13.842 \div$  protein; (2.439) = 5.67.

The  $2\frac{1}{2}$  pounds cotton-seed meal are thus seen to bring the ration very near the German standard for a 1,000-pound milch cow. There is a deficiency of carbohydrates, but the excess of fats compensates for this. It is near enough to the standard for all practical purposes. The proportion of the foods in the above ration is not absolute and unchangeable, but may be varied in a number of ways, so as to get practically the same amounts and proportions of digestible nutrients. What we would have understood is that the above is not the only ration that can be made from those foods containing those quantities of digestible nutrients, but a number may be by varying the proportions of them. This the feeder will have to do for himself, taking into account the quantity and foods he may have and the purposes for which he is feeding. The above is merely an example. If the animal weighs 700 or 800 pounds take seven-tenths ( $\frac{7}{10}$ ) or eight-tenths ( $\frac{8}{10}$ ) of the ration for the 1,000-pound animal, or whatever proportion the weight bears to 1,000.

It will be observed that the total "organic matter" was calculated in the feeding standards, but not in the ration presented above. Organic matter is merely a measure of the bulk of the ration, and, if the ration is not made too bulky, or too concentrated, it need not be further considered.

TABLE III. SHOWING AMOUNT OF ORGANIC SUBSTANCE AND OF DIGESTIBLE NUTRIENTS IN 1, 2, 3, 4, 5, 10, AND 2,000 POUNDS OF FEEDING STUFFS.

FOODS.	Weight. Lbs.	Organic Substance. Lbs.	Total Protein. Lbs.	Carbo- hydrates. Lbs.	Fats. Lbs.
Cowpea-vine hay -----	1	.7958	.098	.3838	.0124
	2	1.5916	.186	.767	.024
	3	2.3874	.279	1.151	.037
	4	3.1832	.372	1.535	.049
	5	3.9790	.465	1.919	.062
	10	7.9580	.931	3.838	.124
	2,000	1591.60	186.20	767.60	24.80
Crimson clover hay -----	1	.8142	.1050	.4131	.00898
	2	1.6384	.210	.826	.018
	3	2.4426	.315	1.239	.027
	4	3.2568	.420	1.652	.036
	5	4.0710	.525	2.065	.045
	10	8.1420	1.050	4.131	.089
	2,000	1628.40	210.00	826.20	17.96
Lucerne, or alfalfa hay -----	1	.8157	.1085	.3716	.0115
	2	1.6314	.217	.743	.023
	3	2.4471	.325	1.114	.034
	4	3.2628	.434	1.486	.046
	5	4.0785	.542	1.858	.057
	10	8.1570	1.085	3.716	.115
	2,000	1631.40	217.00	743.20	23.00
Red-clover hay -----	1	.8222	.0617	.3602	.0103
	2	1.6444	.123	.720	.020
	3	2.4666	.185	1.080	.030
	4	3.2888	.246	1.440	.041
	5	4.1110	.308	1.801	.051
	10	8.2220	.617	3.602	.103
	2,000	1644.40	123.40	720.40	20.60
Alsike clover hay -----	1	.8346	.073	.3852	.0136
	2	1.6692	.146	.770	.027
	3	2.5038	.219	1.155	.040
	4	3.3384	.292	1.540	.054
	5	4.1730	.365	1.926	.068
	10	8.3460	.731	3.852	.136
	2,000	1669.20	146.20	770.40	27.20
Soy (soja) beans (sheep) -----	1	.8451	.2964	.17964	.15886
	2	1.6902	.593	.3593	.3177
	3	2.5353	.889	.5389	.4766
	4	3.3804	1.186	.7186	.6354
	5	4.2255	1.482	.8982	.7943
	10	8.4510	2.964	1.796	1.588
	2,000	1690.20	592.8	359.28	317.72
Soy bean hay -----	1	.8213	.1127	.4231	.0174
	2	1.6426	.225	.846	.034
	3	2.4639	.338	1.269	.052
	4	3.2852	.450	1.692	.069
	5	4.1065	.563	2.115	.087
	10	8.2130	1.12	4.23	.174
	2,000	1642.60	225.40	846.20	34.80
Soy (soja) bean silage -----	1	.2296	.03069	.08930	.0159
	2	.4592	.061	.178	.031
	3	.6888	.092	.267	.047
	4	.9184	.122	.357	.063
	5	1.1480	.153	.446	.079
	10	2.2960	.306	.893	.159
	2,000	459.20	61.38	178.60	31.80

TABLE III. SHOWING AMOUNT OF ORGANIC SUBSTANCE AND OF DIGESTIBLE NUTRIENTS IN 1, 2, 3, 4, 5, 10, AND 2,000 POUNDS OF FEEDING STUFFS.—*Continued.*

FOODS.	Weight. Lbs.	Organic Substance. Lbs.	Total Protein. Lbs.	Carbo- hydrates. Lbs	Fats. Lbs.
Peanut vine hay-----	1	.8461	.0653	.4442	.0298
	2	1.6922	.13060	.888	.059
	3	2.5383	.195.	1.332	.089
	4	3.3844	.261.	1.776	.119
	5	4.2305	.326.	2.221	.149
	10	8.4610	.653.	4.442	.298
	2,000	1692.20	.130.60	888.40	59.60
Corn fodder (whole plant)----	1	.6349	.0260	.3747	.00903
	2	1.2698	.052	.749	.018
	3	1.9047	.078	1.124	.027
	4	2.5396	.104	1.498	.036
	5	3.1745	.130	1.873	.045
	10	6.3490	.260	3.747	.090
	2,000	1269.80	52.0	749.40	18.06
Corn stover (whole plant, minus ears).	1	.7227	.02806	.4233	.0069
	2	1.4454	.054	.846	.013
	3	2.1681	.084	1.269	.020
	4	2.8908	.112	1.693	.027
	5	3.6135	.140	2.116	.034
	10	7.2270	.280	4.233	.069
	2,000	1445.40	56.12	846.60	13.80
Corn tops, cut above ears ----	1	.8059	.0308	.4424	.0162
	2	1.6118	.061	.884	.032
	3	2.4177	.092	1.327	.048
	4	3.2236	.123	1.769	.064
	5	4.0295	.154	2.212	.081
	10	8.0590	.308	4.42	.16
	2,000	1611.80	61.60	884.80	32.40
Corn butts or stubble, portion below ears.	1	.5067	.0037	.3393	.0086
	2	1.0134	.007	.678	.017
	3	1.5201	.011	1.017	.025
	4	2.0268	.014	1.357	.034
	5	2.5335	.018	1.696	.043
	10	5.0670	.037	3.393	.086
	2,000	1013.40	7.40	678.60	17.20
Corn husks or shucks-----	1	.8854	.0098	.6473	.0028
	2	1.7708	.019	1.294	.005
	3	2.6562	.029	1.941	.008
	4	3.5416	.039	2.589	.011
	5	4.4270	.049	3.236	.014
	10	8.8540	.098	6.47	.028
	2,000	1770.80	19.60	1,294.60	5.60
Pulled fodder, blades alone --	1	.8134	.0534	.4334	.0196
	2	1.6268	.106	.866	.039
	3	2.4402	.160	1.300	.058
	4	3.2536	.213	1.733	.078
	5	4.0670	.267	2.167	.098
	10	8.1340	.534	4.334	.196
	2,000	1626.80	106.80	866.80	39.20
Corn silage, whole plant.-----	1	.2686	.00726	.1328	.0040
	2	.5372	.014	.265	.008
	3	.8058	.021	.398	.012
	4	1.0744	.029	.531	.016
	5	1.3430	.036	.664	.020
	10	2.6860	.072	1.328	.040
	2,000	537.20	14.52	265.60	8.00

TABLE III. SHOWING AMOUNT OF ORGANIC SUBSTANCE AND OF DIGESTIBLE DRY MATTER AND NUTRIENTS IN 1, 2 3 4, 5, 10, AND 2,000 POUNDS OF FEEDING-STUFFS — *Continued.*

FOODS.	Weight. Lbs.	Organic substance. Lbs.	Total protein. Lbs.	Carbo- hydrates. Lbs.	Fats. Lbs.
Timothy hay -----	1	.8557	.0303	.4630	.0121
	2	1.7114	.060	.926	.024
	3	2.5671	.090	1.389	.036
	4	3.4228	.121	1.852	.048
	5	4.2785	.151	2.315	.060
	10	8.5570	.303	4.630	.121
Red top hay ( <i>Agrostis vul-</i> <i>garis</i> ) -----	2,000	1711.40	60.60	926.00	24.20
	1	.8455	.0465	.4475	.0094
	2	1.6910	.093	.895	.018
	3	2.5365	.139	1.342	.028
	4	3.3820	.186	1.790	.037
	5	4.2275	.232	2.237	.047
	10	8.4550	.465	4.475	.094
	2,000	1691.00	93.00	895.00	18.80
Orchard grass hay -----	1	.8457	.0408	.4382	.0129
	2	1.6914	.081	.876	.025
	3	2.5371	.122	1.314	.038
	4	3.3828	.163	1.752	.051
	5	4.2285	.204	2.191	.064
	10	8.4570	.408	4.382	.129
	2,000	1691.40	81.60	876.40	25.8
Johnson grass hay -----	1	.8179	.0337	.3980	.0116
	2	1.6358	.067	.796	.023
	3	2.4537	.101	1.194	.034
	4	3.2716	.134	1.592	.046
	5	4.0895	.168	1.990	.058
	10	8.1790	.337	3.980	.116
	2,000	1635.80	67.40	796.00	23.20
Mixed hays -----	1	.7986	.0299	.3788	.0104
	2	1.5972	.059	.757	.020
	3	2.3958	.089	1.136	.031
	4	3.1944	.119	1.515	.041
	5	3.9930	.149	1.894	.052
	10	7.9860	.299	3.788	.104
	2,000	1597.20	59.80	757.60	20.80
Mixed hays (horse) -----	1	.7986	.036	.356	.00376
	2	1.5972	.072	.712	.007
	3	2.3958	.108	1.068	.011
	4	3.1944	0.144	1.424	.015
	5	3.9930	.180	1.780	.018
	10	7.9860	.360	3.560	.037
	2,000	1597.20	72.00	712.00	7.520
Cattail, or pearl millet -----	1	.8331	.0622	.4211	.0091
	2	1.6662	.124	.842	.018
	3	2.4993	.186	1.263	.027
	4	3.3324	.248	1.684	.036
	5	4.1655	.311	2.105	.045
	10	8.3310	.622	4.211	.091
	2,000	1666.20	124.40	842.20	18.20
Sorghum fodder (leaves only) -	1	.8301	.0584	.4582	.0212
	2	1.6602	.116	.906	.042
	3	2.4903	.175	1.364	.063
	4	3.3204	.233	1.832	.084
	5	4.1505	.292	2.291	.106
	10	8.3010	.584	4.783	.212
	2,000	1660.20	116.80	956.60	42.40

TABLE III. SHOWING AMOUNT OF ORGANIC SUBSTANCE AND OF DIGESTIBLE DRY MATTER AND NUTRIENTS IN 1, 2, 3, 4, 5, 10, AND 2,000 POUNDS OF FEEDING-STUFFS.—*Continued.*

FOODS.	Weight. Lbs.	Organic Substance. Lbs.	Total protein. Lbs.	Carbo- hydrates. Lbs.	Fats. Lbs.
Sorghum bagasse .....	1	.8587	.0047	.5218	.0067
	2	1.7174	.009	1.043	.013
	3	2.5761	.014	1.565	.020
	4	3.4348	.018	2.087	.026
	5	4.2935	.023	2.609	.033
	10	8.5870	.047	5.218	.067
	2,000	1717.40	9.40	1,043.60	13.40
Rice bran (sheep) .....	1	.8038	.0933	.5643	.0782
	2	1.6076	.186	1.128	.156
	3	2.4114	.280	1.693	.234
	4	3.2152	.373	2.257	.313
	5	4.0190	.466	2.822	.391
	10	8.0380	.933	5.644	.782
	2,000	1607.60	186.68	1,128.78	156.48
Oat straw .....	1	.8644	?	.4456	.0088
	2	1.7288	?	.891	.017
	3	2.5932	?	1.336	.026
	4	3.4576	?	1.782	.035
	5	4.3220	?	2.228	.044
	10	8.6440	?	4.456	.088
	2,000	1728.80	?	891.20	17.60
Whole raw cotton-seed .....	1	.7959	.0988	.2792	.1688
	2	1.5918	.196	.558	.337
	3	2.3877	.294	.837	.506
	4	3.1836	.393	1.116	.675
	5	3.9795	.491	1.396	.844
	10	7.9590	.983	2.792	1.688
	2,000	1591.80	196.60	558.40	337.60
Whole roasted cotton-seed .....	1	.8842	.0756	.2909	.1611
	2	1.7684	.151	.581	.32
	3	2.6526	.226	.872	.483
	4	3.5368	.302	1.163	.644
	5	4.4210	.378	1.454	.805
	10	8.8420	.756	2.909	1.611
	2,000	1768.40	151.20	581.80	322.20
Cotton-seed meal .....	1	.8560	.3405	.2153	.0919
	2	1.7120	.681	.430	.183
	3	2.6680	1.021	.645	.275
	4	3.4240	1.362	.861	.367
	5	4.2800	1.702	1.076	.459
	10	8.5600	3.405	2.153	.919
	2,000	1712.00	681.00	430.60	183.80
Cotton-seed hulls .....	1	.8612	.00244	.3232	.0232
	2	1.7224	.0048	.646	.046
	3	2.5836	.0073	.969	.069
	4	3.4448	.0097	1.292	.092
	5	4.3060	.0122	1.66	.116
	10	8.6120	.0244	3.232	.232
	2,000	1722.40	48.80	646.40	46.40
Wheat bran .....	1	.8197	.1197	.3684	.0282
	2	1.6394	.239	.736	.056
	3	2.4591	.359	1.105	.084
	4	3.2788	.478	1.473	.112
	5	4.0985	.598	1.842	.141
	10	8.1970	1.197	3.684	.282
	2,000	1639.40	239.40	736.80	56.40

TABLE III. SHOWING AMOUNT OF ORGANIC SUBSTANCES AND OF DIGESTIBLE DRY MATTER AND NUTRIENTS IN 1, 2, 3, 4, 5, 10, AND 2,000 POUNDS OF FEEDING-STUFFS.—*Continued.*

FOODS.	Weight Lbs.	Organic Substance. Lbs.	Total protein. Lbs.	Carbo- hydrates. Lbs.	Fats. Lbs.
Corn meal (cows) -----	1	.8294	.0532	.5916	.0361
	2	1.6588	.106	1.183	.072
	3	2.4882	.159	1.774	.108
	4	3.3176	.212	2.366	.144
	5	4.1470	.266	2.958	.180
	10	8.2940	.532	5.916	.361
	2,000	1658.80	106.40	1,183.20	72.20
Corn meal (pigs) -----	1	.8294	.0785	.6456	.0321
	2	1.6588	.157	1.291	.064
	3	2.4882	.235	1.936	.096
	4	3.3176	.314	2.582	.128
	5	4.1470	.392	3.228	.160
	10	8.2940	.785	6.456	.321
	2,000	1658.80	157.00	1,291.20	64.20
Corn meal (goats) -----	1	.8294	.0532	.5916	.0361
	2	1.6588	.106	1.183	.072
	3	2.4882	.159	1.774	.108
	4	3.3176	.212	2.366	.144
	5	4.1470	.266	2.958	.180
	10	8.2940	.532	5.916	.361
	2,000	1658.80	106.40	1,183.20	72.20
Cowpeas (swine) -----	1	.8197	.1328	.5664	.00708
	2	1.6394	.365	1.132	.014
	3	2.4591	.548	1.699	.021
	4	3.2788	.731	2.266	.028
	5	4.0985	.914	2.832	.035
	10	8.1970	1.828	5.664	.070
	2,000	1639.40	365.6	1,132.8	14.16
Potatoes (swine) -----	1	.2076	.0155	.1733	-----
	2	.4152	.031	.346	-----
	3	.6228	.046	.519	-----
	4	.8304	.062	.693	-----
	5	1.0380	.077	.866	-----
	10	2.0760	.155	1.733	-----
	2,000	415.20	31.04	346.6	-----
Rice bran, or douse (swine) --	1	.8718	.0638	.7888	.0013
	2	1.7436	.127	1.577	.0026
	3	2.6154	.191	2.366	.003
	4	3.4872	.255	3.155	.005
	5	4.3590	.319	3.944	.006
	10	8.7180	.638	7.888	.0130
	2,000	1743.60	127.68	1,577.6	2.60
Rye bran (swine) -----	1	.8477	.0972	.4747	.0161
	2	1.6954	.194	.949	.032
	3	2.5431	.291	1.494	.048
	4	3.3908	.389	1.898	.064
	5	4.2385	.486	2.373	.080
	10	8.4770	.972	4.747	.161
	2,000	1695.40	194.0	949.48	32.34
Carrots (horse) -----	1	.1039	.0113	.0709	-----
	2	.2078	.022	.141	-----
	3	.3117	.034	.212	-----
	4	.4156	.045	.283	-----
	5	.5195	.056	.354	-----
	10	1.0390	.113	.709	-----
	2,000	207.80	22.64	141.84	-----

TABLE III. SHOWING AMOUNT OF ORGANIC SUBSTANCE AND OF DIGESTIBLE DRY MATTER AND NUTRIENTS IN 1, 2, 3, 4, 5, 10, AND 2,000 POUNDS OF FEEDING STUFFS.—*Continued.*

FOODS.	Weight Lbs.	Organic Substance. Lbs.	Total protein. Lbs.	Carbo- hydrates. Lbs.	Fats. Lbs.
Corn and cob meal (goats) ----	1	.8396	.0545	.5904	.0297
	2	1.6792	.109	1.180	.059
	3	2.5188	.163	1.771	.089
	4	3.3584	.218	2.361	.118
	5	4.1980	.272	2.952	.148
	10	8.3960	.545	5.904	.297
	2,000	1679.20	109.00	1,180.00	59.40
Corn and cob meal (pigs) ----	1	.8396	.0633	.5638	.0288
	2	1.6792	.126	1.127	.057
	3	2.5188	.189	1.691	.086
	4	3.3584	.253	2.255	.115
	5	4.1980	.316	2.819	.144
	10	8.3960	.633	5.638	.288
	2,000	1679.20	126.60	1,127.60	57.60
Whole corn (pigs) -----	1	.8793	.0840	.6465	.0362
	2	1.7586	.168	1.293	.072
	3	2.6379	.252	1.939	.108
	4	3.5172	.336	2.586	.144
	5	4.3965	.420	3.232	.181
	10	8.7930	.840	6.465	.362
	2,000	1758.60	168.00	1,293.00	72.40
Corn (horse) -----	1	.8793	.0809	.6515	.0332
	2	1.7586	.161	1.303	.066
	3	2.6379	.242	1.954	.099
	4	3.5172	.323	2.606	.132
	5	4.3965	.404	3.257	.166
	10	8.7930	.809	6.515	.332
	2,000	1758.60	161.80	1,302.92	66.40
Oats -----	1	.8609	.0876	.4611	.0394
	2	1.6218	.175	.922	.078
	3	2.5827	.262	1.383	.118
	4	3.4436	.350	1.844	.157
	5	4.3045	.438	2.305	.197
	10	8.6090	.876	4.61	.394
	2 000	1621.80	175.20	922.20	78.80
Oats (horse) -----	1	.8609	.0904	.4795	.0342
	2	1.6218	.180	.959	.068
	3	2.5827	.271	1.438	.102
	4	3.4436	.361	1.918	.136
	5	4.3045	.452	2.397	.171
	10	8.6090	.904	4.795	.342
	2 000	1621.80	180.96	959.08	68.40
Cowpeas, ground (horse) ----	1	.8197	.178	.5479	.0019
	2	1.6394	.356	1.095	.003
	3	2.4591	.534	1.643	.005
	4	3.2788	.712	2.191	.007
	5	4.0985	.890	2.739	.009
	10	8.1970	1.780	5.479	.019
	2,000	1639.40	356.0	1,095.80	3.80
Cowpeas, ground (ruminants) -	1	.8197	.1827	.5401	.0117
	2	1.6394	.365	1.080	.023
	3	2.4591	.548	1.620	.035
	4	3.2788	.731	2.160	.046
	5	4.0985	.913	2.700	.058
	10	8.1970	1.827	5.401	.117
	2 000	1639.40	365.40	1,080.18	23.46

TABLE III. SHOWING AMOUNT OF DIGESTIBLE DRY MATTER AND NUTRIENTS IN  
1, 2, 3, 4, 5, 10, AND 2 000 POUNDS OF FEEDING-STUFFS.

FOODS.	Weight. Lbs.	Organic Substance. Lbs.	Total Protein. Lbs.	Carbo- hydrates. Lbs.	Fats. Lbs.
Corn and cob-meal-----	1	.834	.065	.563	.029
	2	1.668	.129	1.12	.057
	3	2.502	.194	1.788	.086
	4	3.336	.258	2.251	.115
	5	4.170	.323	2.814	.144
	10	8.340	.646	5.628	.287
	2,000	1668.0	129.2	1125.6	57.4
Barley meal-----	1	.855	.074	.629	.020
	2	1.710	.147	1.258	.039
	3	2.565	.221	1.886	.059
	4	3.420	.294	2.515	.078
	5	4.275	.368	3.244	.098
	10	8.550	.736	6.488	.196
	2,000	1710.0	147.2	1257.6	39.2
Linseed meal (new process)---	1	.840	.279	.364	.027
	2	1.680	.558	.727	.055
	3	2.520	.837	1.091	.082
	4	3.360	1.116	1.454	.109
	5	4.200	1.395	1.818	.137
	10	8.400	2.789	3.636	.273
	2,000	1680.0	557.8	727.2	54.6
Peanut meal-----	1	.846	.429	.228	.069
	2	1.692	.858	.456	.137
	3	2.538	1.283	.685	.206
	4	3.384	1.718	.913	.274
	5	4.230	2.147	1.141	.343
	10	8.460	4.294	2.282	.686
	2,000	1692.0	858.8	456.4	137.2
Hominy chops-----	1	.864	.074	.552	.068
	2	1.728	.149	1.105	.136
	3	2.592	.223	1.657	.204
	4	3.456	.298	2.210	.272
	5	4.320	.372	2.762	.340
	10	8.640	.745	5.524	.680
	2 000	1728.0	149.0	1104.8	136.0
Corn and oats----- (equal parts ground)	1	.859	.074	.612	.037
	2	1.718	.148	1.224	.074
	3	2.577	.222	1.836	.112
	4	3.436	.296	2.448	.149
	5	4.295	.369	3.060	.186
	10	8.590	.739	6.120	.372
	2,000	1718.0	147.8	1224.0	74.4
Barley-----	1	.867	.087	.648	.016
	2	1.734	.174	1.296	.032
	3	2.601	.261	1.944	.048
	4	3.468	.348	2.592	.064
	5	4.335	.435	3.241	.080
	10	8.670	.869	6.483	.160
	2,000	1734.0	173.8	1296.6	82.0
Rye-----	1	.865	.091	.697	.014
	2	1.730	.182	1.394	.027
	3	2.595	.273	2.092	.041
	4	3.460	.365	2.789	.054
	5	4.325	.456	3.486	.068
	10	8.650	.912	6.973	.136
	2,000	1730.	182.4	1394.6	27.2

TABLE III. SHOWING AMOUNT OF DIGESTIBLE DRY MATTER AND NUTRIENTS IN  
1, 2, 3, 4, 5, 10, AND 2,000 POUNDS OF FEEDING-STUFFS.

FOODS.	Weight. Lbs.	Organic Sub-stance. Lbs.	Total Protein. Lbs.	Carbo- hydrates. Lbs.	Fats. Lbs.
Wheat -----	1	.877	.102	.692	.017
	2	1.754	.205	1.384	.034
	3	2.631	.307	2.076	.050
	4	3.508	.409	2.768	.067
	5	4.385	.511	3.460	.084
	10	8.770	1.023	6.921	.168
	2,000	1754.	.204.6	1384.2	.83.6
Wheat midling -----	1	.807	.128	.531	.034
	2	1.614	.256	1.063	.068
	3	2.421	.384	1.594	.102
	4	3.228	.512	2.126	.136
	5	4.035	.640	2.657	.170
	10	8.070	1.279	5.315	.340
	2 000	1614.	.255.8	1063.0	.68.0
Wheat shorts -----	1	.836	.122	.500	.038
	2	1.672	.244	1.000	.077
	3	2.508	.367	1.499	.115
	4	3.344	.489	1.999	.153
	5	4.180	.611	2.499	.191
	10	8.360	1.222	4.998	.383
	2,000	1672.	.244.4	999.6	.77.6
Buckwheat midling -----	1	.820	.173	.266	.045
	2	1.640	.347	.532	.091
	3	2.460	.520	.797	.136
	4	3.280	.694	1.063	.181
	5	4.100	.867	1.334	.227
	10	8.200	1.734	2.658	.454
	2 000	1640.	.346.8	531.6	.90.8
Beets -----	1	.121	.012	.088	
	2	.242	.024	.176	.001
	3	.363	.036	.264	.001
	4	.484	.048	.352	.002
	5	.605	.060	.440	.002
	10	1.210	.120	.880	.005
	2,000	242.	.24.	.176.	1.
Mangel Wurzel -----	1	.080	.010	.056	.001
	2	.160	.020	.112	.002
	3	.240	.030	.168	.003
	4	.320	.040	.224	.004
	5	.400	.050	.280	.005
	10	1.600	.100	1.120	.011
	2 000	160.	.20.	.112.	2.
Turnips -----	1	.085	.008	.065	.001
	2	.170	.016	.129	.002
	3	.255	.024	.194	.003
	4	.340	.032	.258	.004
	5	.425	.040	.323	.005
	10	4.250	.400	.646	.011
	2,000	170.	.16.	.129.	2.
Ruta-bagas -----	1	.102	.009	.077	.001
	2	.204	.018	.155	.002
	3	.306	.026	.232	.003
	4	.408	.036	.309	.004
	5	.510	.044	.387	.005
	10	2.040	.088	.774	.011
	2,000	204.	.18.	.155.8	2.

TABLE III. SHOWING AMOUNT OF DIGESTIBLE DRY MATTER AND NUTRIENTS IN  
1, 2, 3, 4, 5, 10, AND 2,000 POUNDS OF FEEDING-STUFFS.

FOODS.	Weight. Lbs.	Organic Substance. Lbs.	Total Protein. Lbs.	Carbo- hydrates. Lbs.	Fats. Lbs.
Wheat straw -----	1	.862	.008	.379	.005
	2	1.724	.016	.758	.009
	3	2.586	.024	1.137	.014
	4	3.448	.032	1.516	.018
	5	4.310	.040	1.895	.023
	10	8.620	.080	3.790	.045
	2 000	1724.	.32.	758.	9.
Rye straw -----	1	.897	.007	.427	.004
	2	1.794	.014	.854	.007
	3	2.691	.021	1.281	.011
	4	3.588	.028	1.708	.014
	5	4.485	.035	2.135	.018
	10	8.970	.073	4.270	.035
	2,000	1794.	.14.	854.	7.
Hungarian grass hay -----	1	.863	.045	.517	.013
	2	1.626	.090	1.034	.026
	3	2.489	.135	1.551	.039
	4	3.252	.180	2.068	.052
	5	4.115	.225	2.585	.065
	10	8.230	.450	5.170	.130
	2 000	1626.	.90	1034.	.26
Full cow's milk (calves) -----	1	.1402	.0309	.0536	.0534
	2	.2804	.061	.107	.106
	3	.4206	.092	.160	.160
	4	.5608	.123	.214	.213
	5	.7010	.154	.268	.267
	10	1.4020	.309	.536	.534
	2 000	280 40	61.8	107.2	106.84
Buttermilk -----	1	.0795	.0305	.0442	.0025
	2	.1590	.061	.088	.005
	3	.2385	.091	.132	.007
	4	.3180	.122	.176	.010
	5	.3975	.152	.221	.012
	10	.7950	.305	.442	.025
	2,000	159.00	61.00	88.46	5.13
Skim milk -----	1	.088	.031	.047	.008
(Cream raised by setting)	2	.176	.062	.094	.016
	3	.264	.094	.141	.025
	4	.352	.125	.188	.033
	5	.440	.155	.234	.041
	10	.880	.318	.469	.083
	2,000	176.0	62.6	93.8	16.6
Skim milk -----	1	.086	.029	.052	.003
(Cream raised by separator)	2	.172	.059	.105	.006
	3	.258	.088	.157	.009
	4	.344	.118	.210	.012
	5	.430	.147	.262	.015
	10	.860	.294	.524	.029
	2,000	172 0	58.8	104.8	5.8

TABLE IV. COEFFICIENTS OF DIGESTIBILITY OF FEEDING STUFFS.

Foods.	Dry matter.	Total protein.	Fats.	Nitrogen-free extract.	Crude fiber.	Ash.	AUTHORITY.
Cowpea-vine hay.....	59.2	64.5	50.0	70.7	42.9	45.1	N. C. Expt. Sta., Bulletin 87d
Lucerne, or alfalfa hay.....	59.4	72.9	51.2	67.9	46.1	---	N. Y. State Expt. Sta. and O'Brien.
Alsike clover hay.....	54.9	55.5	53.2	64.1	46.2	---	Maine Expt. Sta., 1886-87.
Crimson clover hay.....	62.2	69.1	48.8	71.5	48.7	53.6	N. C. Expt. Sta., Bulletin 87d.
Red clover hay.....	51.7	49.4	42.6	57.6	47.5	---	Armsby.
Peanut-vine hay.....	59.9	63.3	65.9	69.5	51.9	20.4	N. C. Expt. Sta., Bulletin 97.
Soy (soja) bean hay.....	62.4	70.5	41.6	75.4	59.4	23.7	N. C. Expt. Sta., Bulletin 97 and Sturtevant.
Soy (soja) bean silage.....	59.0	75.8	71.9	52.0	54.8	56.7	N. C. Expt. Sta., Bulletin 87d.
Crab grass hay.....	54.9	32.0	35.6	52.8	64.4	51.8	N. C. Experiment Station.
Johnson-grass hay.....	54.5	44.7	39.5	54.4	57.8	56.1	N. C. Expt. Sta., Bulletin 97.
Orchard-grass hay.....	57.3	59.8	54.6	55.6	61.4	35.0	Me. and N. Y. Expt. Stas., Ann. Reps., 1888, and 8th.
Red-top hay.....	57.6	60.4	44.2	59.1	61.2	24.3	Maine Expt. Sta., Ann. Rep., 1888-91, av. 6 determ.
Timothy hay.....	57.8	49.1	55.5	61.3	53.3	34.6	Maine Expt. Sta., Ann. Rep., 1888-91, av. 6 determ.
Mixed hays.....	54.3	47.9	50.0	56.9	47.9	---	N. Y. Expt. Sta., and Sturtevant, 8th Ann. Rep., p. 95.
Meadow (mixed) hay (horse).....	50.22	57.54	18.00	58.12	39.02	---	Ger. Ex., Zusan. u. Verd. der Futtermittel, p. 1216.
Cat-tail, or pearl millet.....	62.3	62.6	46.1	59.1	66.5	68.4	N. C. Expt. Sta., Bulletin 97.
Oat straw.....	50.3	?	38.3	53.2	57.6	---	Maine Expt. Sta., Ann. Rep., 1886-87, p. 76.
Corn fodder, whole plant.....	53.2	54.0	70.6	63.6	68.5	---	Sturtevant, Woll, and Penn. Sta.*
Corn silage, whole plant.....	61.8	34.4	66.0	60.5	43.2	26.9	N. C. Expt. Sta., Bulletin 87d.
Corn stover, whole plant, minus ears.....	60.0	51.3	51.9	63.4	66.7	44.4	Armsby.
Pulled fodder, blades alone.....	60.0	45.2	59.2	63.4	69.1	26.2	Maryland Expt. Sta. Bul. 20, and N. C. Sta. Bul. 87d.
Crushed corn butts or stubble, portion below ear.....	66.5	21.0	79.5	69.0	73.5	11.5	Maryland Expt. Sta., Bulletin 20, p. 12.
Corn husks, or shucks.....	72.0	29.5	32.5	75.0	79.5	16.0	Maryland Expt. Sta., Bulletin 20, p. 12.
Corn tops, cut above ears.....	57.3	38.7	67.3	57.8	70.9	7.5	Texas Sta., Bul. 15, and Maryland Sta., Bul. 20.
Sorghum bagasse.....	60.6	13.7	46.4	64.8	63.8	13.4	N. C. Expt. Sta., Bulletin 97.
Sorghum fodder, leaves alone.....	63.1	60.8	46.7	64.5	70.4	29.5	N. C. Expt. Sta., Bulletin 97.

\* Average of Sturtevant, Woll, and Dent fodder, ears glazing; by Pennsylvania Station, Annual Report 1890, p. 62.

Burrill and Whitman fodder, nubbins glazing; and Burrill and Whitman fodder,

TABLE IV. COEFFICIENTS OF DIGESTIBILITY OF FEEDING STUFFS.—Continued.

Foods.	Dry matter.	Total protein.	Fats.	Nitrogen-free extract.	Crude fiber.	Ash.	AUTHORITY.
Green rape	84.8	88.8	48.5	92.0	87.0	62.7	N. C. Experiment Station.
Cotton-seed hulls	41.1	5.9	79.4	34.3	47.4	21.4	Texas and N. C. Stations.
Whole raw cotton seed	66.1	67.9	87.1	49.6	75.5	43.3	N. C. Expt. Sta., Bulletin 87d.
Whole roasted cotton seed	55.9	47.0	71.7	51.4	65.9	—	N. C. Expt. Sta., Bulletin 87d.
Cotton seed meal	73.3	87.8	89.7	61.5	46.4	31.5	N. C. Expt. Sta., Bulletin 87, and Armsby and Wolff.
Wheat bran	59.3	77.9	73.3	65.8	18.0	—	Me. Expt. Sta., Ann. R. pts. 1889 and 1891, pp. 61, 39.
Corn bran	70.5	53.4	72.3	79.6	53.1	—	N. C. Experiment Station.
Rice bran	64.7	62.9	88.6	78.2	29.2	2.4	N. C. Experiment Station.
Rice bran, or douse (sheep)	89.25	77.33	89.31	100.08	67.29	—	Ger. Ex., Zusam. u. Verd. der Futtermittel, p. 1118.
Rye bran	67.00	65.96	57.53	74.48	9.01	—	Ger. Ex., Zusam. u. Verd. der Futtermittel, p. 1216.
Cowpea meal	86.6	82.0	73.9	93.1	64.0	33.5	N. C. Experiment Station.
Corn meal (cows)	84.6	58.3	91.9	87.1	0	—	N. Y. Expt. Sta., 7th Ann. Rep., p. 279.
Corn meal (goats)	86.9	66.9	80.5	94.2	—	—	N. C. Expt. S a, Bulletin 97.
Corn meal (pigs)	89.5	86.1	81.7	94.2	29.4	—	Maine Expt. Sta., Rept. 1885-'86, p. 61.
Whole corn (pigs)	86.1	79.3	66.6	91.3	43.5	—	Maine and Mnn. Expt. Stas, R. pt. '85-'6, and Bul. 26.
Corn-and-cob meal (pigs)	75.6	75.7	82.0	83.6	28.5	—	Maine Expt. Sta., R. p. 1885-'86 p. 62.
Corn-and-cob meal (goats)	78.7	65.2	84.6	85.6	47.7	—	N. C. Expt. Sta., Bulletin 97.
Rice	98.30	85.80	70.10	99.60	—	—	Ger. Ex., Zusam. u. Verd. der Futtermittel, p. 1110.
Oats	—	77.0	82.0	74.0	17.0	—	German Experiments.
Oats (horse)**	69.36	79.51	71.13	75.08	29.13	—	Ger. Ex., Zusam. u. Verd. der Futtermittel, p. 1216.
Corn (horse)**	88.72	76.42	61.03	93.11	40.46	—	Ger. Ex., Zusam. u. Verd. der Futtermittel, p. 1216.
Field beans, ground (horse)	87.07	85.89	13.20	93.55	65.40	—	Ger. Ex., Zusam. u. Verd. der Futtermittel, p. 1111.
Field beans (ground) ruminants	88.88	88.05	81.51	91.69	71.89	—	Ger. Ex., Zusam. u. Verd. der Futtermittel, p. 1214.
Pease, ground	90.95	88.10	49.23	96.66	68.38	—	Ger. Ex., Zusam. u. Verd. der Futtermittel, p. 1216.
Soy beans (sheep)	85.05	87.22	94.28	62.18	—	—	Ger. Ex., Zusam. u. Verd. der Futtermittel, p. 1113.
Potatoes, solanum tubers (swine)	92.96	72.54	—	98.05	55.11	—	Ger. Ex., Zusam. u. Verd. der Futtermittel, p. 1216.
Sour milk, clabbered (swine)**	94.6	97.7	95.0	98.5	—	—	Zusammen Setzung und Verd. der Futtermittel von
Cow's milk (calves)**	97.88	96.4	99.8	98.2	—	—	Dr. Th. Dietrich und Dr. J. König.

\*\*Organic substance.

TABLE IV. COEFFICIENTS OF DIGESTIBILITY OF FEEDING-STUFFS.—Continued.

FOODS.	Dry matter.	Total protein.	Fats.	Nitrogen-free extract.	Crude fiber.	Ash.	AUTHORITY.
Mixed rations—							
Crab-grass hay	70.9	70.5	54.7	76.5	64.3	45.9	North Carolina Experiment Station.
and cowpea meal 1 }							
Crab-grass hay	66.1	48.7	69.1	74.4	59.7	16.5	North Carolina Experiment Station.
Corn bran 2½ }							
Crab grass hay	59.7	52.4	82.3	66.0	56.0	26.3	North Carolina Experiment Station.
Rice bran 1 }							
Timothy hay	55.3	50.7	50.1	62.1	48.9	22.8	North Carolina Experiment Station.
Cotton-seed meal 16 }							
Timothy hay	53.6	55.9	64.1	59.9	47.2	21.2	North Carolina Experiment Station.
Cotton-seed meal 12 }							
Timothy hay	48.9	54.9	61.5	55.0	41.7	10.4	North Carolina Experiment Station.
Cotton-seed meal 8 }							
Timothy hay	51.5	60.59	74.73	57.30	42.73	5.70	North Carolina Experiment Station.
Cotton-seed meal 4 }							
Timothy hay	59.1	71.42	84.87	66.92	39.45	14.68	North Carolina Experiment Station.
Cotton-seed meal 2 }							
Timothy hay	61.4	75.60	89.00	68.80	27.80	27.40	North Carolina Experiment Station.
Cotton-seed meal 1 }							

TABLE V. SHOWING AVERAGE COMPOSITION OF FEEDING-STUFFS—AMERICAN ANALYSES.

Foods.	No. of analyses.	PERCENTAGE COMPOSITION.						PERCENTAGE OF DIGESTIBLE MATTER.							
		Water.	Dry matter.	Total protein.	Fats (Eth. extract.)	N-free extract.	Crude fiber.	Ash.	Dry matter.	Protein.	Fats.	N-free extract.	Crude fiber.	Ash.	
Cowpea-vine hay	13	11.90	88.10	14.43	2.49	41.22	21.54	8.42	52.15	9.31	1.24	29.14	9.24	3.79	
Crimson clover hay	2	10.85	89.15	15.20	1.84	38.91	25.65	7.73	55.45	10.50	.89	28.82	12.49	4.14	
Lucerne, or alfalfa hay	3	11.53	88.47	14.89	2.24	34.18	30.26	6.90	52.55	10.85	1.15	23.21	13.95	-----	
Red clover hay	35	11.63	88.37	12.50	2.43	40.43	26.81	6.15	45.69	6.17	1.03	23.28	12.73	-----	
Alsike clover hay	6	8.91	91.09	13.18	2.56	40.48	27.22	7.63	50.00	7.31	1.36	25.95	12.57	-----	
Soy (soja) bean silage	1	74.20	25.80	4.05	2.23	6.95	9.70	2.84	15.22	3.07	1.60	3.61	5.31	1.61	
Soy bean hay	3	12.04	87.96	15.98	4.19	34.39	27.57	5.83	54.89	11.27	1.74	25.93	16.38	1.38	
Peanut-vine hay	2	8.34	91.66	10.31	4.52	46.64	23.14	7.05	54.90	6.53	2.98	32.41	12.01	1.44	
Corn silage, whole plant	3	71.98	28.02	2.11	.61	16.42	7.72	1.16	14.91	.73	.40	9.93	3.34	0.30	
Pulled fodder, blades alone	2	8.94	91.06	11.82	3.31	41.45	24.72	9.72	54.64	5.34	1.96	26.28	17.06	2.56	
Corn fodder, whole plant	11	32.19	67.81	4.81	1.28	37.15	20.21	4.32	-----	2.60	.90	23.63	13.84	-----	
Corn stover, whole plant, minus ears	10	22.81	77.19	5.47	1.34	39.90	25.55	4.92	47.70	2.80	.69	25.29	17.04	2.18	
Corn butts or stubble, portion below ears*	1	46.74	53.26	1.76	1.08	27.37	20.46	2.59	35.42	.37	.86	18.89	15.04	.30	
Corn husks or shuck.*	1	8.10	91.90	3.33	0.85	51.55	32.81	3.36	66.17	.98	.28	38.65	26.08	.54	
Corn tops, cut above ears	2	12.19	87.81	7.96	2.44	42.16	28.03	7.22	50.32	3.08	1.62	24.37	19.87	.54	
Sorghum fodder, leaves alone	1	12.43	87.57	9.60	4.55	44.93	23.93	4.56	55.25	5.84	2.12	28.98	16.84	1.34	
Sorghum bagasse	2	11.25	88.75	3.44	1.44	50.47	30.52	2.88	53.78	.47	.67	32.72	19.46	.38	
Timothy hay	58	10.21	89.79	6.18	2.19	46.91	30.29	4.23	51.90	3.03	1.21	30.16	16.14	1.46	
Red top hay (Agrostis vulgaris)	4	9.52	90.48	7.70	2.14	46.19	28.52	5.93	52.12	4.65	.94	27.30	17.45	1.44	
Orchard grass hay	6	9.80	90.20	6.82	2.38	42.12	33.23	5.63	51.68	4.08	1.29	23.42	20.40	1.95	
Johnson grass hay	3	12.30	87.70	7.55	2.93	41.62	29.69	5.91	47.80	3.37	1.16	22.64	17.16	3.32	
Cat-tail, or pearl millet	2	10.47	89.53	9.94	1.97	36.62	30.78	10.22	55.78	6.22	.91	21.64	20.47	6.99	
Mixed hays	10	15.41	84.59	6.25	2.09	40.30	31.21	4.73	45.93	2.99	1.04	22.93	14.95	-----	
Meadow (mixed) hay (horse)	-----	-----	-----	-----	-----	-----	-----	-----	40.11	3.60	-----	23.42	12.18	-----	
Same composition as above															

\*Analyses from Bulletin 20, Maryland Experiment Station.

TABLE V. SHOWING AVERAGE COMPOSITION OF FEEDING-STUFFS—AMERICAN ANALYSES—Continued.

Foods.	No. of analyses.	PERCENTAGE COMPOSITION.						PERCENTAGE OF DIGESTIBLE MATTER.						
		Water.	Dry matter.	Total protein.	Fats (Eh. extract.)	N-free extract.	Crude fiber.	Ash.	Dry matter.	Protein.	Fats.	N-free extract.	Crude fiber.	Ash.
Oat straw	13	8.84	91.16	3.80	2.29	39.12	41.23	4.72	45.85	?	.88	20.81	23.75	---
Whole raw cotton-seed	1	17.51	82.49	14.48	19.38	25.41	20.30	2.90	54.53	9.83	16.88	12.60	15.32	1.25
Whole roasted cotton-seed	1	9.32	90.68	16.09	22.48	25.78	24.03	2.26	50.69	7.56	16.11	13.25	15.84	---
Cotton-seed meal	4	7.74	92.26	38.78	10.25	30.20	6.37	6.66	67.63	34.05	9.19	18.57	2.96	2.10
Cotton-seed hulls	5	11.50	88.50	4.15	2.92	39.14	39.87	2.38	36.37	.24	2.32	13.42	18.90	.51
Wheat bran	70	12.43	87.57	15.37	3.85	53.44	9.32	5.60	51.92	11.97	2.82	35.16	1.68	---
Corn meal (cows)	63	15.61	84.39	9.12	3.93	67.92	1.99	1.45	71.39	5.32	3.61	59.16	.07	---
Corn meal (pigs)	Same composition as for cows.								75.53	7.85	3.21	63.98	.58	---
Corn (digested by horse)	Same composition as for cows.								78.01	8.09	3.32	64.30	0.84	---
Corn meal (digested by goats)	Same composition as for cows.								71.39	5.32	3.61	59.16	---	---
Whole corn (pigs)	201	10.52	89.48	10.59	5.44	69.81	2.09	1.55	77.04	8.40	3.62	63.74	.91	---
Corn-and-cob meal (goats)	9	14.52	85.48	8.36	3.51	65.03	7.06	1.52	67.27	5.45	2.97	55.67	3.37	---
Corn-and-cob meal (pigs)	Same composition as for goats.								64.62	6.33	2.88	54.37	2.01	---
Oats†	25	10.94	89.06	11.38	4.81	60.05	9.85	2.97	---	8.76	3.94	44.44	1.67	---
Oats (horse)	Same composition.								59.71	9.05	3.42	45.08	2.87	---
Rice bran, or douse (sheep)	5	9.65	90.35	12.07	8.76	50.04	9.51	9.97	80.63	9.33	7.82	50.04	6.39	---
Cowpea, a bean, ground (horse)	5	14.81	85.19	20.75	1.44	55.72	4.06	3.22	74.16	17.82	0.19	52.13	2.66	---
Cowpea, a bean, ground (ruminants)	Same composition as for horse.								75.72	18.27	1.17	51.09	2.91	---
Cowpea, ground (swine)	Same composition as for horse.								77.48	18.28	.70	53.86	2.77	---
Soy beans (sheep)	8	10.80	89.20	33.98	16.85	28.89	4.79	4.69	75.86	29.64	15.88	17.96	---	---
Rye bran (swine)	12	11.64	88.36	14.74	2.81	63.74	3.48	3.59	59.20	9.72	1.61	47.47	.31	---
Rice (swine)	10	12.44	87.56	7.44	0.19	79.20	0.35	0.38	86.07	6.38	.13	78.88	---	---
Potatoes (swine)	12	78.89	21.71	2.14	0.10	17.36	0.56	0.95	19.62	1.55	---	17.02	.30	---
Buttermilk	1	91.49	8.51	3.19	0.27	4.49	---	0.56	8.05	3.05	.25	---	---	---
Carrots (horse)	15	88.59	11.41	1.14	0.42	7.56	1.27	1.02	9.95	1.13	---	7.09	---	---
Cow's milk, composite (calves)	85, 26, 14, 74	---	---	3.21	5.37	5.44	---	0.72	14.41	3.09	5.36	5.34	---	---

<sup>†</sup>Compilation of Dr. E. H. Jenkins, Annual Report Connecticut Experiment Station, 1888.

TABLE V. SHOWING COMPOSITION OF FEEDING-STUFFS—AMERICAN ANALYSES — *Continued.*

Foods.	No. of analyses.	PERCENTAGE COMPOSITION.								PERCENTAGE OF DIGESTIBLE MATTER.				
		Water.	Dry matter.	Total protein.	Fats (Eth. extract.)	N-free extract.	Crude fiber.	Ash.	Dry matter.	Protein.	Fats.	N-free extract.	Crude fiber.	Ash.
Crab-grass hay	2	10.31	89.69	6.92	1.62	40.96	32.92	7.27	---	2.21	0.577	21.63	21.20	3.77
Cowpea meal	1	12.63	87.37	22.25	1.59	56.47	3.69	3.37	---	18.25	1.175	52.57	2.36	1.13
Rice bran	1	10.22	89.78	13.50	10.72	46.47	10.86	8.23	---	8.49	9.50	36.65	3.17	0.20
Corn bran	1	10.80	89.20	9.77	5.74	61.96	9.32	2.37	---	5.22	4.15	49.32	4.95	---
Rape (first growth)	1	81.52	18.48	4.02	0.77	8.13	2.29	2.29	---	3.64	0.42	7.63	2.06	1.75
Rape (first growth)	1	85.06	14.94	3.85	0.58	5.87	1.45	2.02	---	3.36	0.25	5.28	1.22	0.99